

Pseudogout of the First Metatarsophalangeal Joint Associated with Hallux Valgus

An Atypical Bilateral Case

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Calcium pyrophosphate dihydrate crystal deposition disease has various clinical features, and pseudogout is one of the six clinical forms. Chondrocalcinosis is the term used to describe the radiographic appearance of the disease. A review of the literature revealed that the appearance of this type of arthropathy in the foot is infrequent. We offer a review of the disease and report an atypical bilateral case of pseudogout in a patient 56 years of age without a history who presented with symptoms of arthritis localized in the first metatarsophalangeal joint associated with hallux valgus and was treated surgically. Radiographic evaluation of the feet did not reveal signs of chondrocalcinosis. The patient had no metabolic abnormalities, except for high uric acid values. Chemical analysis of the surgical samples demonstrated the presence of calcium pyrophosphate dihydrate crystals, confirming the diagnosis. We believe that arthropathy by deposition of calcium pyrophosphate dihydrate in the foot, although rare, must be considered in the podiatric physician's differential diagnosis when a patient presents with articular pain in the foot associated or not with deformities. (J Am Podiatr Med Assoc 100(2): 138-142, 2010)

Calcium pyrophosphate dihydrate deposition disease, in its various clinical presentations, affects approximately 8% to 10% of individuals older than 60 years.¹ It is more frequent in women older than 50 years, and its frequency increases with age. Thus, in those older than 65 years, the prevalence is approximately 4%, and after age 80 years, it rises to 30%.^{2,3} The characteristic radiologic calcifications that define the disorder are due, in most cases, to the deposition of calcium pyrophosphate dihydrate crystals.

Although the etiopathogeny of the disease is unknown, classically, three etiologic groups are distinguished: idiopathic chondrocalcinosis (by far the most frequent form of the disorder), family or hereditary chondrocalcinosis, and chondrocalcinosis associated with or secondary to other diseases. Up to six different clinical forms of arthropathy by deposition of calcium pyrophosphate dihydrate have been described. One of the most frequent is pseudogout, which represents 25% to 45% of cases and affects particularly the major joints, generally the knee.⁴ On oc-

casión, it is confused with an acute attack of gout: the pain is very intense and is accompanied by fever (which can be very high), affecting the general state, and with leukocytosis from the analysis. In such cases, the diagnosis must be differentiated from septic arthritis. Episodes of arthritis can be triggered by trauma, can be postoperative, or can be attributable to serious disorders such as ischemic heart disease or cerebrovascular accidents.⁵

Chondrocalcinosis is the term normally used to describe the characteristic radiologic signs of the disorder that are manifested as the presence of a linear calcification bordering the joint. Besides the hyaline cartilage, other periarticular fibrocartilaginous structures can be affected such as the synovial capsule, tendons, and ligaments.⁶ Nevertheless, it is estimated that approximately 10% of patients with arthropathy by deposition of calcium pyrophosphate dihydrate do not have radiologic signs of chondrocalcinosis, sometimes because the deposits are too small or because articular degeneration obstructs its visualization.⁵

Analysis of the disease is nonspecific. There may be an increase of reactants in the acute phase (globular sedimentation rate and C-reactive protein level) in the episodes of acute arthritis besides leukocytosis with leftward deviation. In the acute phase, the

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synovial fluid has inflammatory characteristics (15,000–30,000 cells/ μ L, with a strong predominance of polymorphonuclear cells). Calcium pyrophosphate dihydrate crystals in synovial fluid can be easily detected by chemical analysis or by demonstrating the presence of the weakly birefringent crystals with a polarized light microscope. The presence of these crystals confirms the diagnosis, with no margin of error.

The literature reports few cases of chondrocalcinosis localized in the foot and, specifically, in the metatarsophalangeal joints. This is largely because the most frequent clinical form of the disease is type E or asymptomatic, according to the classification of McCarty,⁴ and it is revealed casually in a radiologic examination.⁷ On the other hand, type C (pseudoarthrosis with deterioration) and type D (pseudoarthrosis) compose 20% to 50% of the cases of arthropathy by deposition of calcium pyrophosphate dihydrate, and the two are easily confused with osteoarthritis, almost always affecting major joints, especially the knees.⁴ However, the absence of metabolic abnormalities in the most common form of the disorder and the absence of radiologic findings of chondrocalcinosis, together with its low prevalence of clinical signs in the foot, means that few cases are reported.

A descriptive study was performed by Fam et al⁷ in 50 patients affected by arthropathies by deposition of calcium pyrophosphate dihydrate in one or more joints. It was observed that of the 117 joints affected by chondrocalcinosis, the knee, the wrist, and the pubic symphysis were affected in 80.41% and the shoulders, elbows, and interphalangeal joints of the hand and intervertebral disks in 17.09%; only 2.5% of the joints affected were in the foot (tarsus and metatarsophalangeal joints).⁷ The joints of the foot most frequently affected are those of the rearfoot and midtarsus and, to a lesser degree, those of the forefoot (tarsometatarsal and metatarsophalangeal joints). The interphalangeal joints seem not to be affected.⁸

A literature review revealed few reported cases of the disorder localized in the foot in either its primary or secondary presentation. In most cases, it is manifested as a set of symptoms of arthritis associated or not with chondrocalcinosis. Hanft et al⁹ describe a case of pseudogout in the ankle of a 78-year-old woman without radiologic signs of chondrocalcinosis who presented with a degenerative cystic lesion at the level of the articular cartilage of the distal epiphysis of the tibia. Samples taken by arthroscopy confirmed the presence of calcium pyrophosphate dihydrate crystals.⁹

Similarly, cases of arthropathy by deposition of calcium pyrophosphate dihydrate localized in the

foot as a secondary sign of the disease are also few. Most of the cases described are associated with symptoms of the disease that coursed with inflammation and pain. Kobayashi et al¹⁰ described two cases of chondrocalcinosis associated with primary hyperparathyroidism, one of which was manifested by acute pain and swelling of the ankle and dorsum of the patient's right foot.

In a series of 439 patients treated surgically for osteoarthritis in the first metatarsophalangeal joint by Weinfeld and Schon¹¹ in 1998, not a single case of arthropathy by deposition of calcium pyrophosphate dihydrate was found. The most frequent cause of arthritis by deposition was gout, with 19 cases.¹¹

Luisiri et al¹² described a case of the disorder in a 79-year-old woman without a family history of arthritis who had pain and inflammation in the first metatarsophalangeal joint of her right foot. Radiologic examination revealed a considerable subcutaneous periarticular calcification dorsomedial to the articulation. Needle puncture aspiration demonstrated the presence of crystals with positive birefringence by polarized light microscopy, confirming the diagnosis of periarticular pseudogout.¹²

The simultaneous occurrence of a combined arthropathy (septic arthritis and calcium pyrophosphate disease) in the same joint has previously been reported.^{13, 14} The authors described cases in which large joints, such as the knees, wrists, and elbows, are affected. Feller and Block¹⁵ observed a patient in whom septic arthritis and calcium pyrophosphate deposition disease were found in the first metatarsophalangeal joint of his left foot.

Case Report

A 56-year-old woman who communicated no pathologic history of interest presented to the Aljarafe Podiatric Center (a private facility) at Castilleja de la Cuesta, Seville, on October 5, 2007, with severe pain and functional weakness for the preceding week in the first metatarsophalangeal joint of the right foot. The pain was accompanied by swelling and erythema, but there were no chills or fever.

Physical examination revealed articular pain under palpation, which worsened under passive mobilization of the joint, and moderate hallux valgus. The skin of the area had cutaneous depigmentation dorsomedial to the metatarsophalangeal joint in both feet as a consequence of contact dermatitis, according to the patient, produced by a shoe 11 months earlier (Fig. 1).

Radiologic exploration showed swelling of the soft parts, moderate hallux abductus valgus, and the absence of an articular degenerative process (Fig. 2).

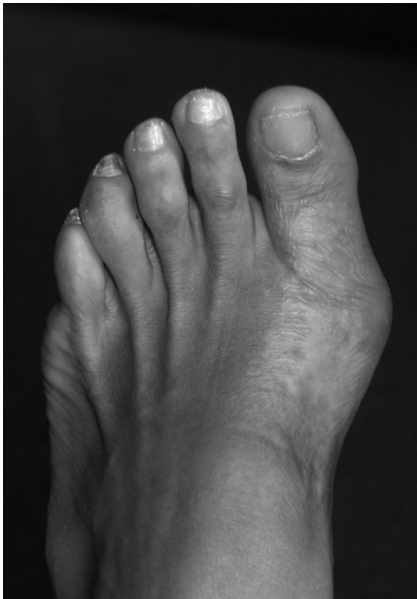


Figure 1. Preoperative appearance of the left foot.



Figure 2. Anteroposterior radiograph of the right foot showing swelling of the soft parts, moderate hallux abductus valgus, and the absence of articular chondrocalcinosis.

Because of suspected bursitis, a needle puncture aspiration was performed to extract synovial fluid. The result was negative, but removal of the needle was accompanied by the appearance of whitish-crystalline material, leading to the suspected presence of acute symptoms of gout. Treatment with colchicine was begun, and a control analysis was requested. The treatment was stopped after 3 days because of gastrointestinal intolerance; instead, ibuprofen, 600 mg every 8 hours, was given. The patient was reexamined after a week and showed substantial improvement in symptoms. The analysis showed an increased globular sedimentation rate (48 mm/h), slight hypercholesterolemia, and a high uric acid value (9.9 mg/dL). The patient was referred to the internal medicine department for monitoring, and once the symptoms abated, she was scheduled for surgery a month later to correct the hallux valgus.

During surgery, the presence of multiple deposits of intra-articular material slightly affecting the cartilage was observed (Fig. 3). The joint was cleaned, and a biopsy was performed for histochemical study. The surgical correction of the deformity was performed by Austin and Akin proximal osteotomies (Fig. 4). The postoperative evolution was normal. Chemical analysis of the sample demonstrated the presence of calcium pyrophosphate dihydrate crystals, confirming the diagnosis of pseudogout.

To rule out chondrocalcinosis associated with other diseases, a subsequent full analysis was performed,

including general biochemistry, thyroid (thyrotropin, triiodothyronine, and thyroxine), and hepatic tests and blood magnesium, calcium, and phosphorus. It did not reveal abnormalities, except for high cholesterol and uric acid values.

On September 12, 2008, she was seen again with acute inflammatory symptoms that affected the first metatarsophalangeal joint of the left foot, accompa-



Figure 3. Intraoperative image of the right foot showing the presence of multiple deposits of intra-articular material slightly affecting the cartilage.



Figure 4. Radiographic aspect of the left foot in the acute phase of pseudogout.

nied by slight fever and general discomfort. Radiologic examination revealed no data of interest except swelling of the soft parts and moderate hallux valgus (Fig. 5). Treatment with ibuprofen, 600 mg, was begun, and a general analysis showed an increase in acute-phase reactants (globular sedimentation rate and C-reactive protein level). Once the acute symptoms abated, surgery was scheduled. During the surgical procedure, intra-articular material identical to that found in the right foot was observed (Fig. 4), and samples were collected. The results of the chemical analysis revealed the presence of calcium pyrophosphate dihydrate crystals.

Discussion

Although it is certain that the most common clinical form of chondrocalcinosis is idiopathic, it cannot be ruled out that it might coexist with other pathologic conditions. Numerous metabolic disorders associated with arthropathy by deposition of calcium pyrophosphate dihydrate have been described, many of which can be a coincidence of the two in the same patient. Various disorders are associated with articular chondrocalcinosis, although there is discussion as to whether in some it is an actual association or a casual coexistence. There is evidence of an actual association in hemochromatosis (association of up to 50%), primary hyperparathyroidism, hypomagnesemia, and hypophosphatasia in the adult.¹⁶⁻¹⁹



Figure 5. Intraoperative image of the left foot showing the abundant presence of calcium pyrophosphate dihydrate inside the joint.

Although pseudogout is a disorder that rarely presents clinical signs in the foot, it must be considered in the differential diagnosis as a clinical syndrome in patients (especially women) with inflammatory arthropathies with or without radiologic signs. There is controversy about the association between gout and chondrocalcinosis. However, the coexistence of chondrocalcinosis and hyperuricemia in the same patient, as in the case presented herein, is not infrequent, and some studies^{19, 20} indicate that it is an actual association, although only to a moderate degree.

Despite the low prevalence of clinical signs of chondrocalcinosis in the foot compared with other anatomical locations, some recent studies seem to demonstrate a greater prevalence of asymptomatic calcifications of soft parts of the rearfoot in patients with arthropathies by deposition of calcium pyrophosphate dihydrate without radiologic signs of articular chondrocalcinosis in the foot.

Falsetti et al²¹ performed a masked study using ultrasonography in a group of 57 individuals with osteoarthritis in different locations and secondary to different clinical presentations of chondrocalcinosis in accord with the criteria described by McCarty.⁴ The subjects were diagnosed by visualization of calcium pyrophosphate dihydrate crystals in the synovial fluid of the affected joint. Two control groups were used: one of 50 patients with osteoarthritis without radiologic signs of chondrocalcinosis and the other of volunteer healthy subjects. Echographic explorations were made in the heels of all of the subjects. The

study revealed calcifications in 57.9% of patients with chondrocalcinosis and in no controls. Calcifications were found in the insertion of the fascia plantar in 15.8% of patients with chondrocalcinosis and in 2% of the group with osteoarthritis. The authors concluded that asymptomatic calcifications of the Achilles tendon are frequent in patients with chondrocalcinosis and that such findings are, thus, intimately related to the disease.²¹

Conclusions

Arthropathy by deposition of calcium pyrophosphate dihydrate in the foot, although rare, must be considered in the podiatric physician's differential diagnosis when a patient is first seen with articular pain in the foot associated or not with deformities. In the present case, the suspected diagnosis of the disease by deposition (gout), after the needle puncture, enabled an early surgical procedure that facilitated not only the cleaning of the joint but also the correction of the deformity, preserving the articular functionality in a middle-aged woman with an atypical bilateral syndrome.

Early surgical treatment must, therefore, be contemplated in a suspected diagnosis of the disease, once the acute symptoms abate, given that there is no therapeutic method to slow the process of calcium pyrophosphate dihydrate deposition. The cases of advanced chondrocalcinosis are only ancillary to radical surgical treatments such as the use of articular prostheses, showing the importance of early diagnosis.

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Conflict of Interest: None reported.

References

1. FELSON DT, ANDERSON JJ, NAIMARK A, ET AL: The prevalence of chondrocalcinosis in the elderly and its association with knee osteoarthritis: the Framingham study. *J Rheumatol* **16**: 1241, 1989.
2. DOHERTY M, DIEPPE P, WATT I: Pyrophosphate arthropathy: a prospective study. *Br J Rheumatol* **32**: 189, 1993.
3. SANMARTÍ R, PAÑELLA D, BRANCÓS MA, ET AL: Prevalence of articular chondrocalcinosis in elderly subjects in a rural area of Catalonia. *Ann Rheum Dis* **52**: 418, 1993.
4. MCCARTY DJ: Calcium pyrophosphate dihydrate crystal deposition disease: nomenclature and diagnostic criteria. *Ann Intern Med* **87**: 241, 1977.
5. MARTÍNEZ TABOADA VM, BLANCO ALONSO R, ALONSO BARTOLOMÉ B, ET AL: Artropatías microcristalinas. II. Artritis por pirofosfatos. *Medicine* **8**: 1773, 2001.
6. URI DS, DALINKA MK: Imaging of arthropathies: crystal disease. *Radiol Clin North Am* **34**: 359, 1996.
7. FAM AG, TOPP JR, STEIN HB, ET AL: Clinical and roentgenographic aspects of pseudogout: a study of 50 cases and review. *Can Med Assoc J* **124**: 545, 1981.
8. DE LANGE EE, KEATS TE: Localized chondrocalcinosis in traumatized joints. *Skeletal Radiol* **14**: 249, 1985.
9. HANFT JR, KASHUK KB, SCHABLER JA: Pseudogout of the ankle: a case study and arthroscopic-assisted treatment. *J Foot Surg* **30**: 173, 1991.
10. KOBAYASHI S, SUGENOYA A, TAKAHASHI S, ET AL: Two cases of acute pseudogout attack following parathyroidectomy. *Endocrinol Jpn* **38**: 309, 1991.
11. WEINFELD SB, SCHON LC: Hallux metatarsophalangeal arthritis. *Clin Orthop Relat Res* **349**: 9, 1998.
12. LUISIRI P, BLAIR J, ELLMAN MH: Calcium pyrophosphate dihydrate deposition disease presenting as tumoral calcinosis (periarticular pseudogout). *J Rheumatol* **23**: 1647, 1996.
13. JARRET MP, GRAYZEL AI: Simultaneous gout, pseudogout, and septic arthritis. *Arthritis Rheum* **23**: 128, 1980.
14. SMITH RJ, PHELPS P: Septic arthritis, gout, pseudogout and osteoarthritis in the knee of a patient with multiple myeloma. *Rheumatology* **15**: 89, 1972.
15. FELLER SR, BLOCK P: Sepsis and calcium pyrophosphate deposition disease in the same joint: a case report. *JAPMA* **75**: 158, 1985.
16. GENNANT HK, HECK LL, LANZI LH, ET AL: Primary hyperparathyroidism: a comprehensive study of clinical, biochemical and radiographic manifestations. *Radiology* **109**: 513, 1973.
17. HAMILTON EB, BOMFORD AB, LAWS JW, ET AL: The natural history of arthritis in idiopathic haemochromatosis: progression of the clinical and radiological features over ten years. *Q J Med* **199**: 321, 1981.
18. JONES AC, CHUCK AJ, ANE EA, ET AL: Diseases associated with calcium pyrophosphate deposition disease. *Semin Arthritis Rheum* **22**: 188, 1992.
19. SANMARTÍ R, SERRAROLS M, GALINSOGA A, ET AL: Enfermedades asociadas a la chondrocalcinosis articular: análisis de una serie de 95 casos. *Med Clin* **101**: 249, 1993.
20. HOLLINGWORTH P, WILLIAMS PL, SCOTT JT: Frequency of chondrocalcinosis of the knees in asymptomatic hyperuricemia and rheumatoid arthritis: a controlled study. *Ann Rheum Dis* **41**: 344, 1982.
21. FALSETTI P, FREDIANI B, ACCIAI C, ET AL: Ultrasonographic study of Achilles tendon and plantar fascia in chondrocalcinosis. *J Rheumatol* **31**: 2242, 2004.